Space Weather Technical Forecast

Issued on Saturday, 13 August 2022 at 13:08 Local

This technical forecast provides a four day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

Space Weather Forecast Headline: Ongoing Active electron fluence.

Analysis of Space Weather Activity over past 24 hours
Solar Activity: Solar activity has been Low over the past 24 hours, but with an increasing number of C-class flares during the period. The peak of these events was a C6 at 13/0732UTC, which originated from AR3079. There are currently 8 sunspot regions on the visible disc. The new region in the northeast, numbered AR3081, grew significantly during the period and is now classified Dai/Beta-Delta. This region, along with AR3076 and AR3079, provide the main flare risk at the present time. That said, the recent C-class flaring was well-spread between regions. There was little change evident in the remainder of the magnetically simple groups. No Earth-directed CMEs were observed.

Solar Wind / Geomagnetic Activity: The solar wind, as measured by DSCOVR and ACE at L1, is showing a waning fast wind environment, perhaps that related to CH12/+. The wind speed was elevated over the past 24 hours, with a gradual decreasing trend from near or just below 600 km/s to just above 500 km/s. The density was at average or above average levels. The IMF was weak throughout at 6 nT or below. The north-south component varied weakly between +/-5 nT. The phi angle was mostly positive (away from the Sun), but with some negative variations. Geomagnetic activity was Quiet (Kp 0-2).

Energetic Particles / Solar Radiation: The high energy proton flux (greater than 10 MeV), as measured by GOES16, was at Background levels.
The high energy electron flux (greater than 2 MeV) was High throughout, with a peak of 3.31e3 pfu at 12/1615 UTC. The 24-hour integrated electron fluence was above Active throughout, with a declining trend and with an observed value of 2.12e8 integrated pfu at 13/0000UTC.

Four-Day Space Weather Forecast Summary
Solar Activity: Solar activity is likely to be at Low levels, with a chance of rising to Moderate.

Solar Wind / Geomagnetic Activity: No Earth-directed CMEs feature in the current forecast. Earth is currently experiencing a waning high speed stream. This feature is considered to have long since peaked in terms of geomagnetism. Wind speeds are expected to slowly decline through the next 24-48 hours, likely becoming ambient by the end of the period. There is a slight chance of an isolated Active interval at first should prolonged negative Bz arrive while the solar wind is still elevated, however this too should decrease through the next 24 hours to leave a largely Quiet remainder of the forecast, perhaps with the odd Unsettled interval.

Energetic Particles / Solar Radiation: The high energy proton flux (greater than 10 MeV) is likely to remain at Background levels, although with a slight chance of an S1 or greater event. High energy electron flux is expected to persist above the High (1e3 pfu) threshold through this period. Electron fluence is also expected to remain above the Active (1e8 integrated pfu) threshold throughout.

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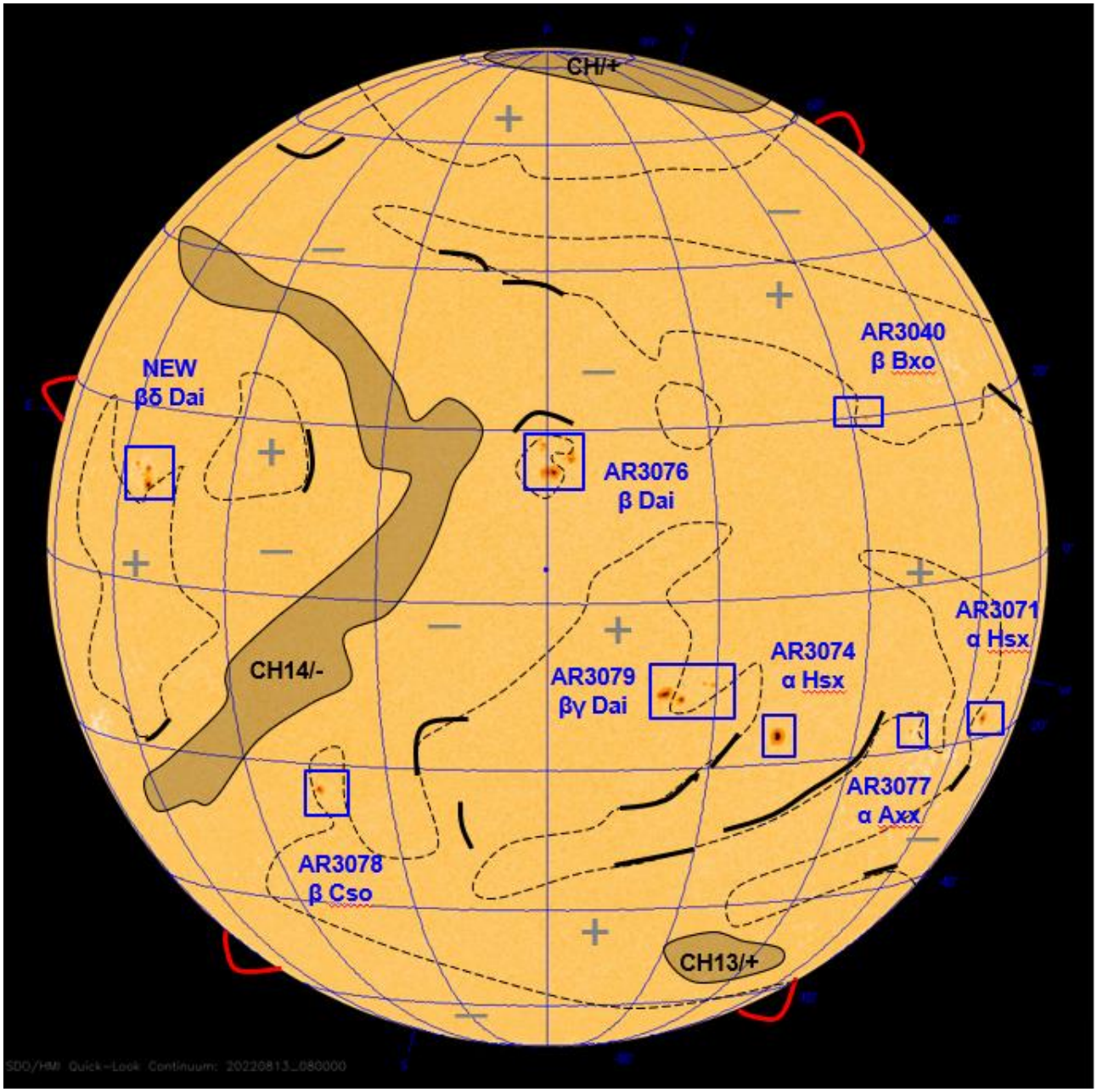
Figure 1. Solar Analysis Valid 13/0800 UTC.



Key: Filament ___ , Prominence ___ , Magnetic Field Line - - - , Polarity +/-, Coronal Holes: Grey shaded area CHxx +/-, Sunspot groups 25xx - Mt Wilson α-β-βγ-βγδ and Zurich-McIntosh Axx etc.

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Geomagnetic Storms:

No Earth-directed CMEs feature in the current forecast.

The current positive polarity high speed stream is either that emanating from CH12/+, or possibly the tail end of CH10/+. Whichever coronal hole it originates from, this feature is considered to have long since peaked in terms of geomagnetism, with the IMF now near background levels. Wind speeds are expected to slowly decline through the next 24-48 hours, likely becoming ambient by the end of the period.

There is a slight chance of an isolated Active interval at first should prolonged negative Bz arrive while the solar wind is still elevated, however this too should decrease through the next 24 hours to leave a largely Quiet remainder of the forecast, perhaps with the odd Unsettled interval.

Geo-Magnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	G1 to G2	No	1	1	1	1
Strong	G3	No	1	1	1	1
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

Geomagnetic Activity - Earthbound Coronal Mass Ejections

Date/time 21.5R (UTC)	Halo: Full or Partial	Source	Source Location	Estimated Speed	Estimated Arrival Time	Comments
*	*	*	*	*	*	*

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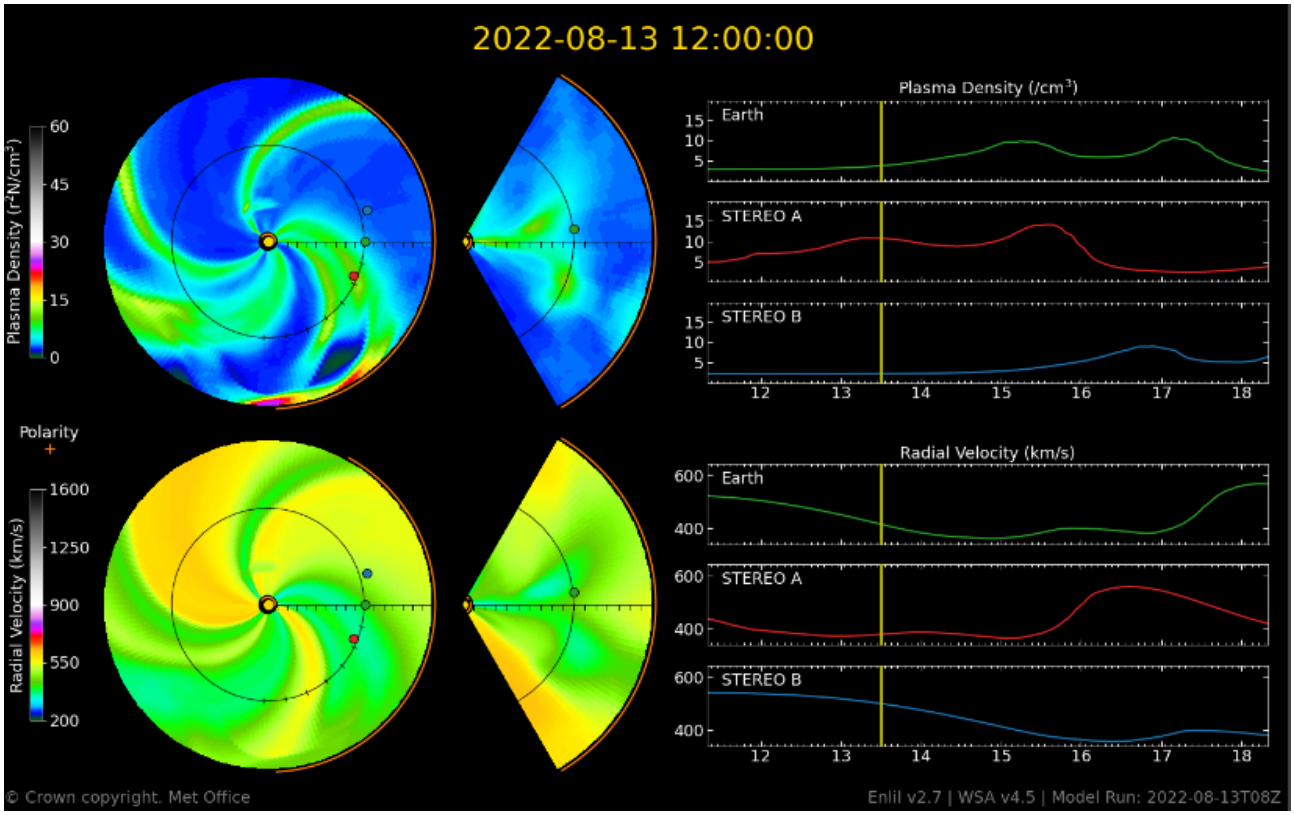
Figure 2: MOSWOC Enlil model showing a decline in the current high speed stream. A further increase is likely after the end of this 4 day period, on 17 or 18 August.



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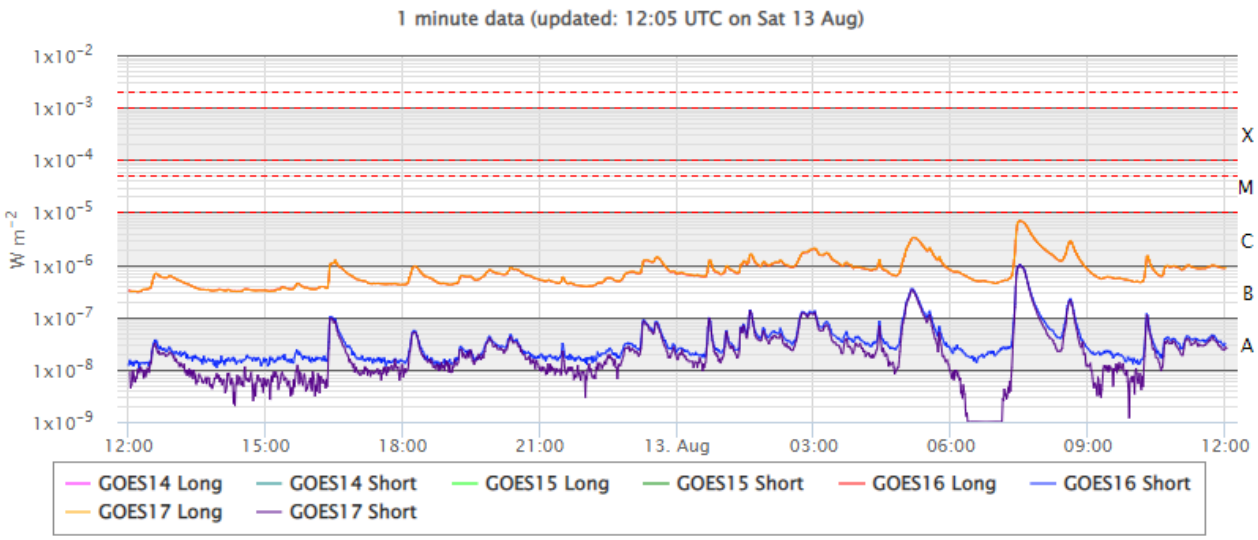
Radio Blackouts - X-Ray Flares:
Solar activity is currently Low, although the size and frequency of C-class flares has increased in the past 24 hours, as well as the 10.7cm Penticton flux. AR3081 in the northeast has grown significantly in recent hours and is the main rationale for the increased probability of M-class flares. In addition, AR3076 and AR3079 both have sufficient complexity to potentially give some larger flares.

No groups of note leave the disc in the period, while there are signs on STEREO A EUVI 195 imagery that there may be further returning regions to rotate on in the next couple of days. Any rise in risk will be assessed as and when these regions present on the visible disc.

X Ray Flares	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability			(%)	(%)	(%)	(%)
Active	R1-R2 M Class	No	30	30	30	30
Very Active	R3 to R5 X Class	No	2	2	2	2

Figure 3: Recent increase in frequency and magnitude of C-class flares.



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Solar Radiation Storms - (High Energy Protons):
The high energy proton flux (greater than 10 MeV) is currently at Background levels, and is likely to remain at this level through the period.

Both AR3076 and AR3079 have a very slight risk of proton events and are now in the western hemisphere. The increase in complexity of AR3081 is one to watch, although this is currently in the eastern disc. There is a slightly increasing risk of S1 or greater in the four days, mainly due to AR3081 moving towards centre disc, but the increase is too slight to represent in the probability tables at present.

Radiation Storms Probability (Exceedance)	Level (cm^{-2} sr^{-1} s^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	**≥ S1**	No	5	5	5	5
Very Active	**≥ S3 ***	No	1	1	1	1

* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)

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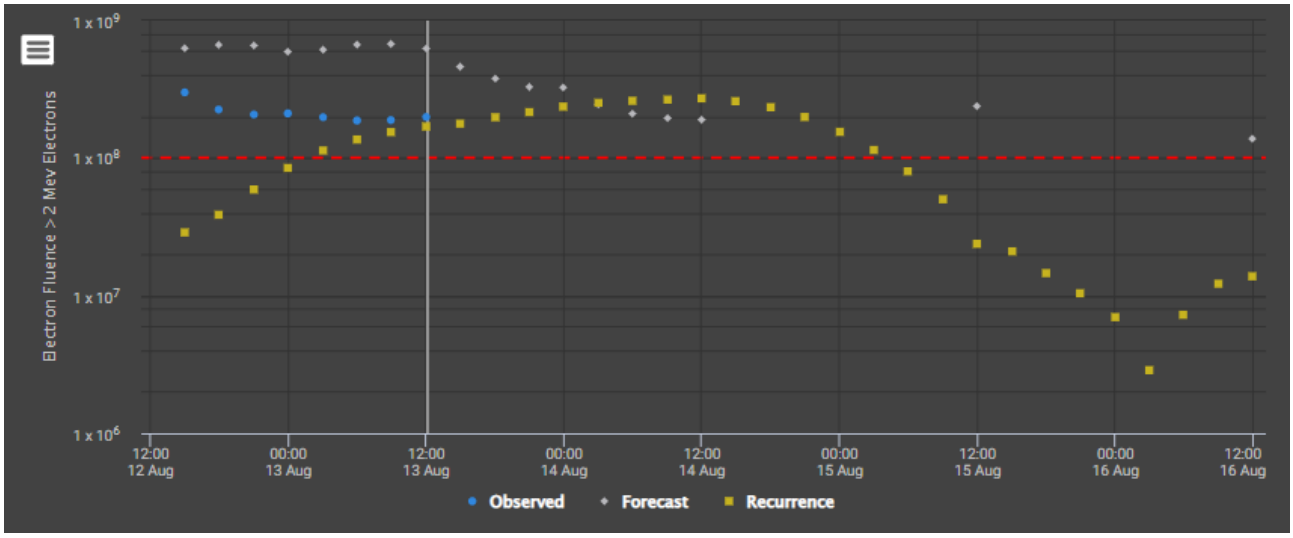
High Energy Electrons Event (≥ 2MeV):
High energy (greater than 2 MeV) electron flux as observed by GOES16 was High throughout the last 24 hours. The flux could have potential to rise further in the immediate term now that the geomagnetic activity is dying down, assuming that the activity has not redistributed electrons.

All considered, the fluence may show a rising trend, but is unlikely to have the legs to reach Very Active, with comfortably Active levels probably maintained throughout the four days in the likely absence of any further HSS or CME activity.

GEO Electron Environment	Level ($cm^{-2}\ sr^{-1}\ day^{-1}$)	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability (Exceedance)			(%)	(%)	(%)	(%)
Active	≥ 2 MeV ≥ $1x10^8$	Yes	100	99	90	80
Very Active	≥ 2 MeV ≥ $1x10^9$	No	1	1	1	1

Figure 4: MOSWOC REFM showing an above Active (1e8 integrated pfu) forecast, which is a reasonable trend.



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